

SUMMARY
OF
FIRE PROTECTION PROGRAMS
OF THE
UNITED STATES DEPARTMENT OF ENERGY
CALENDAR YEAR 1994

OFFICE OF
WORKER HEALTH AND SAFETY

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FOREWORD

This edition of the Annual Fire Protection Program Summary for the Department of Energy (DOE) continues the series started in 1972.

Since May 1950, an annual summary has been submitted from each field organization under the requirements of two previous government agencies: the Atomic Energy Commission (AEC) and the Energy Research Development Administration (ERDA). Reports are currently promulgated through DOE Orders 5480.7, "Fire Protection," and 5484.1, "Environmental Protection, Safety and Health Reporting Requirements."

Beginning in 1981, all individual accident reports from DOE Order 5484.1 have been compiled by the Computerized Accident Incident Reporting System (CAIRS) administered by EG&G, Idaho. Each quarter year CAIRS issues the Occupational Injury and Property Damage Summary (CAIRS Summary), which statistically reports on DOE loss topics such as: injuries and illness, fatalities, non-fire, and fire losses. The Annual Fire Protection Program Summary (AFPR) tabulates a calendar year summary from field organizations, which includes a more comprehensive look at the DOE fire protection program. Both fire and nonfire loss statistics are provided, as are reports on a broad range of fire protection activities including: automatic suppression system performance, Fire Department responses, and the recurring cost of fire protection at DOE. Loss statistics from the AFPR are also used to validate the CAIRS system, incorporating any necessary revisions to the official DOE database.

The report for calendar year (CY) 1994 was summarized from information sent to Headquarters by 21 out of 27 field organizations representing approximately 92 percent of DOE's holdings. For comparison purposes, field offices are arranged according to the CAIRS reporting format, with a total of 20 categories represented. Abbreviations are identified in the Glossary, as are the DOE site and Management and Operations (M&O) contractors and major definitions.

GLOSSARY

Field Organization abbreviations

AL	Albuquerque Operations
CH	Chicago Operations
ETC	Energy Technology Centers ¹
GFO	Golden Field Office
HQ	Headquarters (DOE)
ID	Idaho Operations
NPR	Naval Petroleum Reserves ²
NV	Nevada Operations
OAK	Oakland Operations (San Francisco)
OH	Ohio Field Office
OR	Oak Ridge Operations
PA	Power Administrations ³
PNR	Pittsburgh Naval Reactors Office
RF	Rocky Flats Operations
RL	Richland Operations
SNR	Schenectady Naval Reactors Office
SPR	Strategic Petroleum Reserves
SR	Savannah River Operations
SSC	Superconducting Super Collider Project
YM	Yucca Mountain Site Characterization Project Office

Site or M&O Contractor abbreviations

ANL-W	Argonne National Laboratory, West
BM	Bryan Mound Crude Oil Storage Site
BNL	Brookhaven National Laboratory
ETEC	Energy Technology Engineering Center
FA	Fermi National Accelerator Laboratory
HAN	Hanford Site
INEL	Idaho National Engineering Laboratory
ITRI	Inhalation Toxicology Research Institute
K-25	Oak Ridge's K-25 Site

¹Energy Technology Center organizations are comprised of: the Bartlesville Project Office (BPO); the Pittsburgh Energy Technology Center (PETC); and the Morgantown Energy Technology Center (METC).

²Naval Petroleum Reserve organizations are comprised of: the Naval Petroleum Reserves in California (NPR-1), and the Naval Petroleum & Oil Shale Reserves in CO, UT, and WY (NPR-2,3).

³Power Administration organizations are comprised of: the Alaska Power Administration (APA); the Bonneville Power Administration (BPA); Southeastern Power Administration (SEPA), Southwestern Power Administration (SWPA); and the Western Area Power Administration (WAPA).

KAPL	Knolls Atomic Power Laboratory .
KCP	Kansas City Plant
KSO	Kesserling Site
LANL	Los Alamos National Laboratories
LLNL	Lawrence Livermore National Laboratories
MMES	Martin Marietta Energy Systems
MPO	Mound Site
NDU	Notre Dame University
NRF	Naval Reactor Facilities
NTS	Nevada Test Site
ORNL	Oak Ridge National Laboratories
PAN	Pantex Site
PGDP	Paducah Gaseous Diffusion Plant ⁴
PI	Pinellas Site
PNL	Pacific Northwest Laboratory
POR	Portsmouth Gaseous Diffusion Plant ⁴
PPPL	Princeton Plasma Physics Laboratory
REECo	Reynolds Electrical and Engineering Company
ROSS	Ross Aviation, Inc.
SLAC	Stanford Linear Accelerator Center
SNLA	Sandia National Laboratories, Albuquerque
SNLL	Sandia National Laboratories, Livermore
SRS	Savannah River Site
WH	West Hackenberry
WHC	Westinghouse Hanford Company
WI	Weeks Island Site
WS	Windsor Site
Y-12	Oak Ridge's Y-12 Plant

The below reference is used throughout the report to identify various DOE elements:

DOE Field Organization (abr.)/Site or M&O Contractor (abr.)

⁴ On July 1, 1993, a lease agreement took effect between the DOE and the United States Enrichment Corporation (USEC), essentially transferring all ownership responsibilities to USEC.

DEFINITIONS

The following terms are defined in the text of DOE Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements." Section references are made at the end of the definition.

1. Property Value: The approximate replacement value of all DOE-owned buildings and equipment. Calculate this by applying to the original cost (or most recent appraised value) an appropriate cost index ratio (cost index published by "Engineering News Record" shall be used). Include the cost of all DOE-owned supplies and average inventory of all source and special nuclear materials. Exclude the cost of land, land improvements (such as sidewalks or roads), and below ground facilities not susceptible to damage by fire or explosion (such as major water mains and ponds). (CHAPTER 5.1)
2. Estimated Loss: Monetary loss determination based on all estimated or actual costs to restore DOE property and equipment to preoccurrence conditions irrespective of whether this is done in fact. Estimate includes: (1) any necessary nuclear decontamination; (2) restoration in areas that received water or smoke damage; and (3) any reductions for salvage value. Estimate excludes: (1) down time; and (2) any outside agency payments. Losses sustained on private property is not reportable, even if DOE is liable for damage and loss consequences resulting from the occurrence. Categorization of occurrences shall be by fire loss and nonfire loss events. (CHAPTER 5.2)
3. Fire Loss: All damage or loss sustained as a consequence of (and following the outbreak of) fire shall be classified as a fire loss. Exceptions are as follows: (1) burnout of electric motors and other electrical equipment through overheating from electrical causes shall be considered a fire loss only if self-sustained combustion exists after power is shut off; (2) vehicle losses (including aircraft, marine and railroad equipment) shall be included in the fire loss category only if determined that the loss was sustained as a direct consequence of fire (fire damage resulting from other consequences of the vehicle loss shall be classified within the respective vehicle loss category); and (3) fire losses involving cargo during transportation should be treated as a transportation loss. (CHAPTER 4.2. c. (1). c) (CHAPTER 5.2. c. (3))
4. Nonfire Loss: All damage or loss sustained as a consequence of the following events: (1) explosions; (2) natural cause events (such as earthquakes and hurricanes); (3) electrical malfunctions; (4) transportation (cargo) losses; (5) mechanical malfunctions; (6) radiation releases or other nuclear accidents; and (7) miscellaneous accidents (such as thermal, chemical or corrosion-related accidents). (CHAPTER 4.2. c)
5. Loss Rate: Unit of comparison in cents loss per \$100 of property value.

EXECUTIVE SUMMARY

The DOE experienced no fatalities or major injuries caused by fire in CY 1994. BNL, however, experienced a 68-day program delay caused by a fire in the High Flux Beam Reactor (HFBR) facility. In all, 112 reported fire incidents produced a total fire loss of approximately \$1.4 million. This equates to an overall rate of approximately 0.11 cents of fire loss sustained for each \$100 of DOE-controlled property value; an increase of about 85 percent over last year's figure.

Recurring costs for fire protection activities exceeded \$104 million for the year, an increase of 5 percent over last year's figure. Approximately 86 percent of this total was attributed to fire department and system maintenance activities, with the remaining amount spent on engineering fees.

The performance of automatic suppression systems highlights the importance of installing and maintaining these systems. During the year, four fires were controlled by automatic suppression systems, thus minimizing significant damage and program interruption. Two of these fires were contained by wet pipe sprinkler systems, continuing the DOE track record on sprinkler effectiveness at a 99 percent rate. Control of the remaining fires were achieved with dry-pipe automatic suppression systems.

The above successes were, however, offset by the inadvertent actuation of 220 suppression systems primarily due to sprinkler system freeze-ups. Also, concerns remain on the inadvertent Halon discharge issue, which caused the release of approximately 3,159 pounds of agent to the environment in CY 1994. This number represents a 72 percent reduction in last year's figure. The DOE is committed to minimizing active quantities of this ozone depleting substance through implementation of its Halon phaseout guidelines.

Future activities of the fire protection community center on reducing the fire risk at DOE sites, optimizing costs associated with fire protection, and providing support for mission advances within the Department.

DOE FIRE LOSS STATISTICS

Property value estimates were taken from the CAIRS database since this information is more accurate to serve as a common denominator when comparing AFPR loss rates to the CAIRS Summary. CAIRS data shows that DOE values rose by approximately 4.2 percent in CY 1994.

DOE experienced no fatalities resulting from fire in CY 1994. Seven fire-related injuries (one Type B Investigation) were identified at DOE due to botched maintenance or experimental activities. CH reports that as a result of the TRISTAN fire described below, the HFBR and associated experimental activities were shut down for 68 days to complete clean-up and restarting of the reactor.

In all, a total of 112 fire incidents were reported by field organizations accounting for total year-end fire losses of \$1,417,138. The CY 1994 CAIRS Summary reports that 21 fire incidents caused losses totaling \$562,752; approximately \$854,000 less than field reports. Of this difference, approximately \$793,000 can be traced to two incidents where a CAIRS report was not submitted. The remaining discrepancy relates to either pending reports, or fires that did not exceed the \$1,000 CAIRS reporting threshold.

Field organizations did not consistently report the number of nonfire events, but did identify loss amounts totaling \$2,287,327. The CAIRS Summary reports 63 nonfire incidents producing losses of \$893,718. Of this difference, \$688,000 can be traced to a single incident where a CAIRS report was not submitted.

DOE's fire loss rate for CY 1994, as summarized from field organization reports, is approximately 0.11 cents loss per \$100 value; an increase of about 83 percent over last year's 0.06 cent figure. This statistic is 55 percent lower than the 1987-1993 DOE average of 0.20 continuing the downward trend in fire loss rates over last year. In comparison, the loss rate average for the Highly Protected Risk (HPR) insurance industry was about 0.30 cents per \$100 value⁵.

The largest fire and nonfire losses for the year are noted below. Business interruption was excluded from consideration:

1. BPA - Slag from a welding operation caused internal fire to C-phase T-1355 Transformer. Loss estimated to be \$570,000. No CAIRS or ORPS reports identified.

⁵Factory Mutual Research Corporation (FMRC) reports that the loss rate average is based on fire losses involving both sprinkler and nonsprinkler actuation within the HPR class of protection.

2. OR/K-25 - Approximately 182 sprinkler systems froze up during severe cold weather conditions. Loss estimated at \$688,000. No CAIRS or ORPS reports identified.

Trending loss data indicates that a small number of incidents constitute the majority of losses reported to the DOE. For example, the five largest fire incidents accounted for approximately 91 percent of the total loss category.

Monetary fire losses are, however, influenced by a number of factors including: fire prevention activities, automatic suppression system performance, and fire department response. These determine a fire's consequence and serve as an indicator of DOE's overall success rate within the fire protection program. For example, 82 percent of all DOE CY 1994 fires were considered insignificant (losses of up to \$1,000) due in part to the success of the program. Because of this, all fires will continue to be reported through annual field reports, with year-end summaries provided in this publication.

The following table characterizes DOE's loss history. Information includes a nonfire loss rate category along with a 5-year rate averaging category (numbers shown in parentheses) where applicable. The accompanying figures provide a graphical representation of the loss data, and a breakdown of year-end losses according to field organizations. Sites that are not identified reported either insignificant or zero losses for the year.

Fire Protection Summary
For Calendar Year 1994

TABLE 1: DOE LOSS HISTORY FROM 1950 TO PRESENT

YEARS	VALUE (Millions of Dollars)	FIRE LOSS (Dollars)	NON-FIRE LOSS (Dollars)	LOSS RATES		
				Fire	Non-Fire	Total
50	1,800.00	486,389	10,050	270	0.06	2.76
51	2,177.10	38,318	317,797	0.18	1.46	1.64
52	3,055.10	449,107	356,600	1.47	1.17	2.64
53	4,081.00	148,142	427,430	0.36	1.05	1.41
54	6,095.90	185,438	190,436	0.30	0.31	0.61
55	6,954.20	125,685	330,103	0.18(1.00)	0.47(0.81)	0.65(1.81)
56	7,364.10	2,206,478	940,945	3.00(0.50)	1.28(0.89)	4.28(1.39)
57	7,973.20	590,663	885,936	0.74(1.06)	1.11(0.86)	1.85(1.92)
58	8,102.50	275,560	476,265	0.34(0.92)	0.59(0.84)	0.93(1.76)
59	10,301.80	199,841	998,060	0.19(0.91)	0.97(0.75)	1.16(1.66)
60	10,708.60	636,228	764,823	0.59(0.89)	0.71(0.88)	1.30(1.77)
61	11,929.90	325,489	5,530,566	0.27(0.97)	4.64(0.93)	4.91(1.90)
62	12,108.80	3,020,023	293,341	2.49(0.43)	0.24(1.60)	2.73(2.03)
63	13,288.90	599,056	776,998	0.45(0.78)	0.58(1.43)	1.03(2.21)
64	14,582.80	480,519	870,516	0.33(0.80)	0.60(1.43)	0.93(2.23)
65	15,679.30	1,743,448	2,106,621	1.11(0.83)	1.34(1.35)	2.45(2.18)
66	16,669.00	158,220	698,753	0.09(0.93)	0.42(1.48)	0.51(2.41)
67	17,450.90	359,584	2,423,350	0.21(0.89)	1.39(0.64)	1.60(1.53)
68	18,611.90	155,986	713,097	0.08(0.44)	0.38(0.87)	0.46(1.31)
69	20,068.30	27,144,809	909,525	13.53(0.36)	0.45(0.83)	13.98(1.19)
70	22,004.30	89,456	1,611,336	0.04(3.00)	0.73(0.80)	0.77(3.80)
71	24,155.80	78,483	1,857,566	0.03(2.79)	0.77(0.67)	0.80(3.46)
72	26,383.50	222,590	698,061	0.08(2.78)	0.26(3.74)	0.34(3.52)
73	27,166.70	117,447	2,258,241	0.04(2.75)	0.83(0.52)	0.87(3.27)
74	28,255.50	249,111	930,766	0.09(2.74)	0.33(0.61)	0.42(3.35)
75	31,658.30	766,868	4,485,481	0.24(0.06)	1.42(0.58)	1.66(0.64)
76	35,512.70	251,849	2,040,727	0.07(0.10)	0.57(0.72)	0.64(0.82)
77	39,856.10	1,084,823	2,529,161	0.27(0.10)	0.63(0.68)	0.90(0.78)
78	47,027.10	12,976,036	4,501,943	2.76(0.14)	0.96(0.76)	3.72(0.90)
79	50,340.80	654,716	1,886,307	0.13(0.69)	0.37(0.78)	0.50(1.47)
80	54,654.70	1,385,686	7,160,249	0.25(0.69)	1.31(0.79)	1.56(1.48)
81	59,988.80	2,042,633	2,600,855	0.34(0.70)	0.43(0.77)	0.77(1.47)
82	65,360.40	948,691	3,252,277	0.15(0.75)	0.50(0.74)	0.65(1.49)
83	70,484.40	731,234	9,765,828	0.10(0.73)	1.39(0.71)	1.49(1.44)
84	82,166.90	1,549,807	4,917,513	0.19(0.19)	0.60(0.80)	0.79(0.99)
85	86,321.84	1,145,975	2,983,322	0.13(0.21)	0.35(0.85)	0.48(1.06)
86	82,787.52	805,030	4,490,262	0.10(0.18)	0.54(0.65)	0.64(0.83)
87	91,927.20	1,570,736	1,440,093	0.17(0.13)	0.16(0.68)	0.33(0.81)
88	92,998.00	466,120	7,837,000	0.05(0.14)	0.84(0.61)	0.89(0.75)
89	107,948.00	615,551	6,890,000	0.06(0.13)	0.64(0.50)	0.70(0.63)
90	115,076.00	8,392,746	9,078,000	0.73(0.10)	0.79(0.51)	1.52(0.61)
91	119,236.00	623,940	2,019,000	0.05(0.22)	0.17(0.59)	0.22(0.81)
92	119,294.00	1,260,950	3,647,805	0.11(0.21)	0.31(0.52)	0.42(0.73)
93	120,733.88	781,269	3,193,534	0.06(0.20)	0.26(0.55)	0.32(0.75)
94	125,822.40	1,417,138	2,287,372	0.11(0.20)	0.18(0.43)	0.29(0.63)

Figure 1
DOE PROPERTY VALUATION

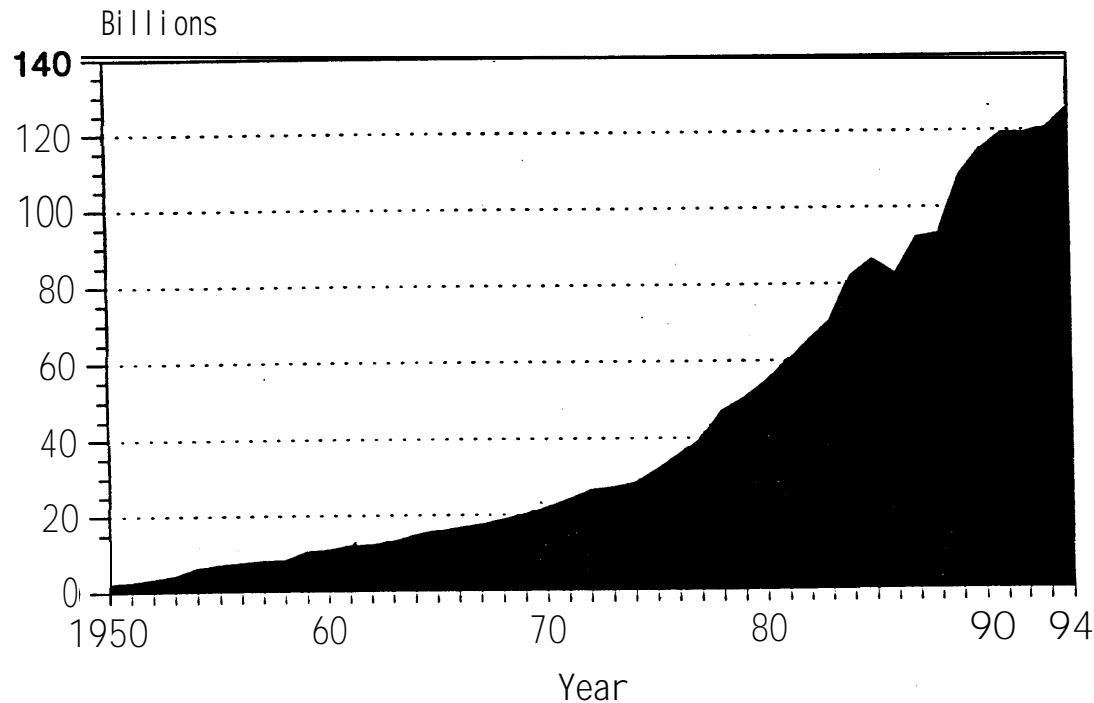


Figure 2
PROPERTY LOSS

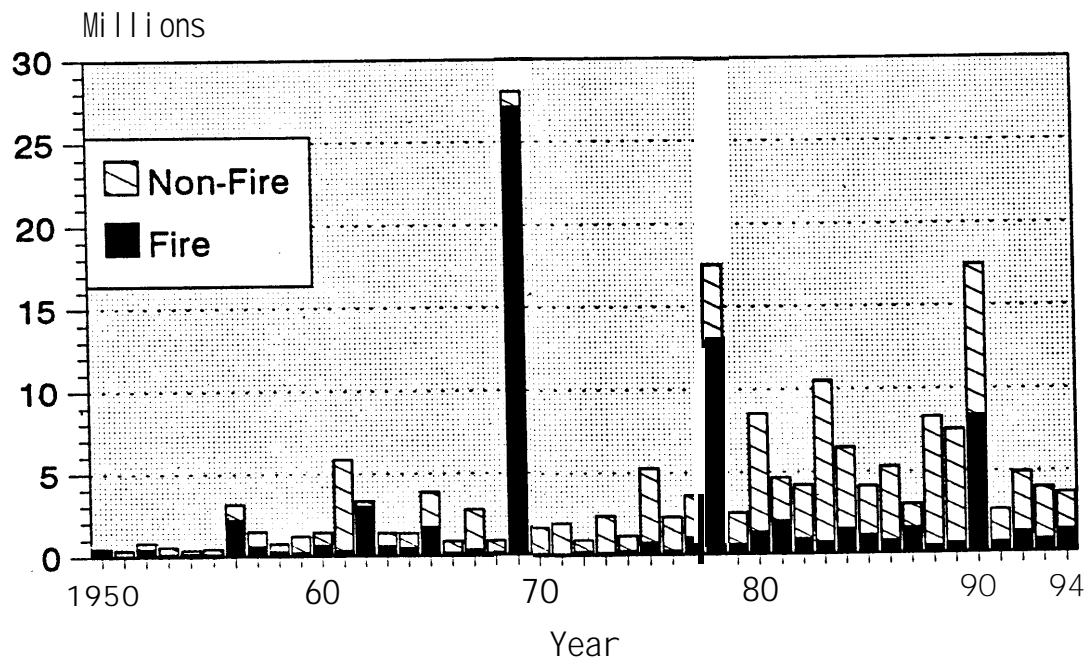


Figure 3
DOE LOSS RATES

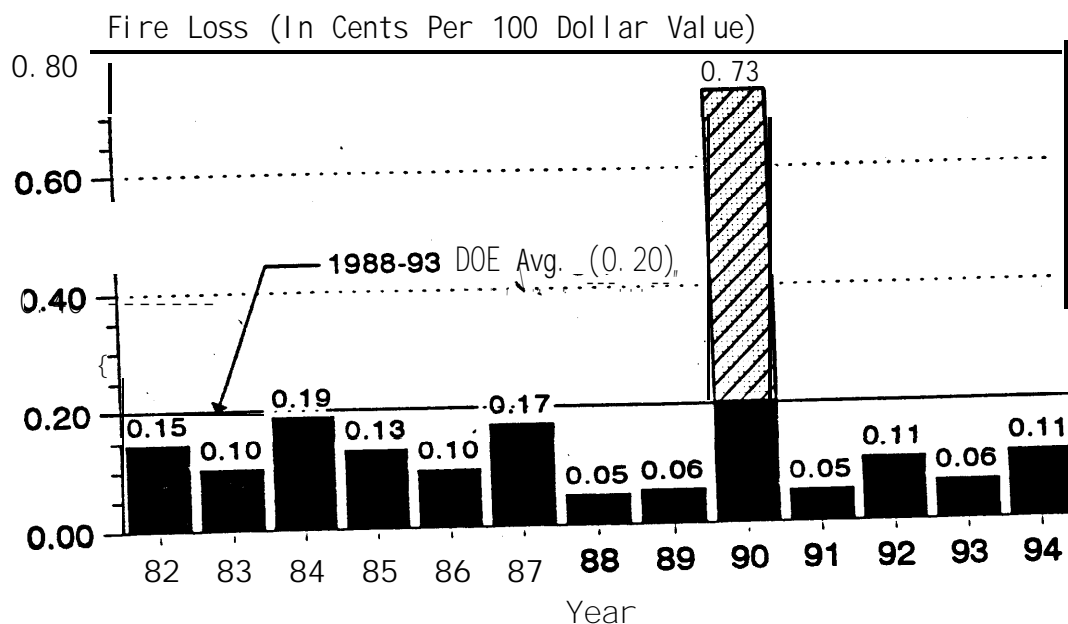


Figure 4
DOE LOSS RATES

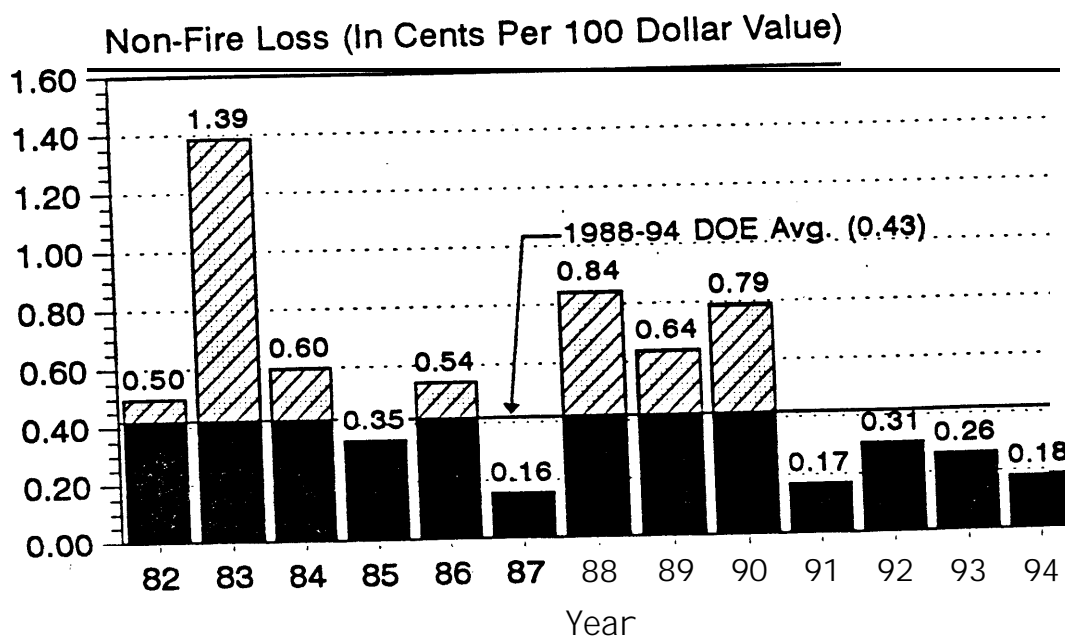


Figure 5

LOSS RATES-BY FIELD- ORGANIZATIONS

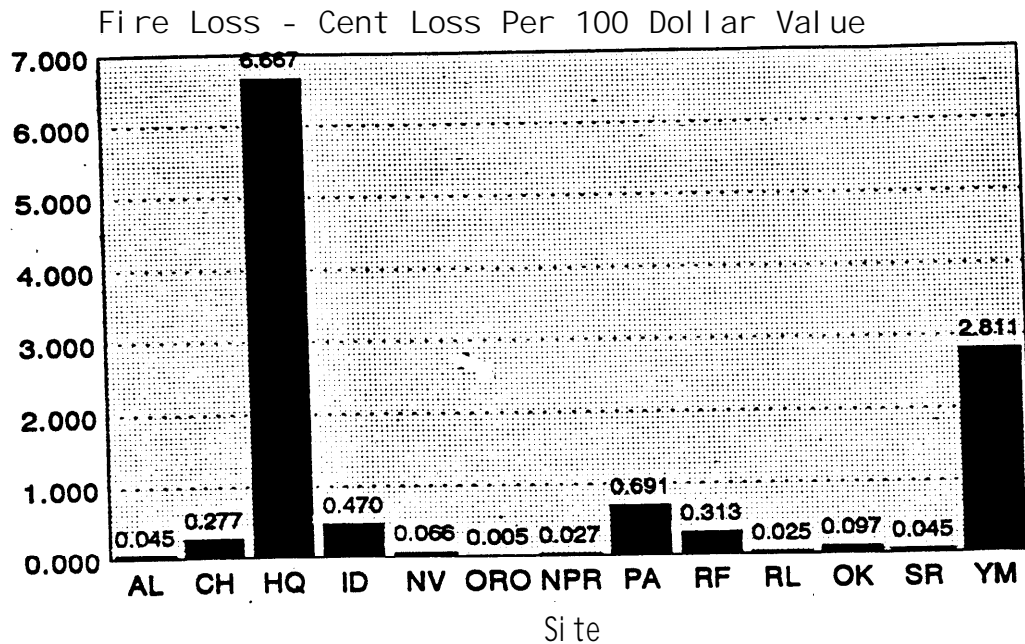
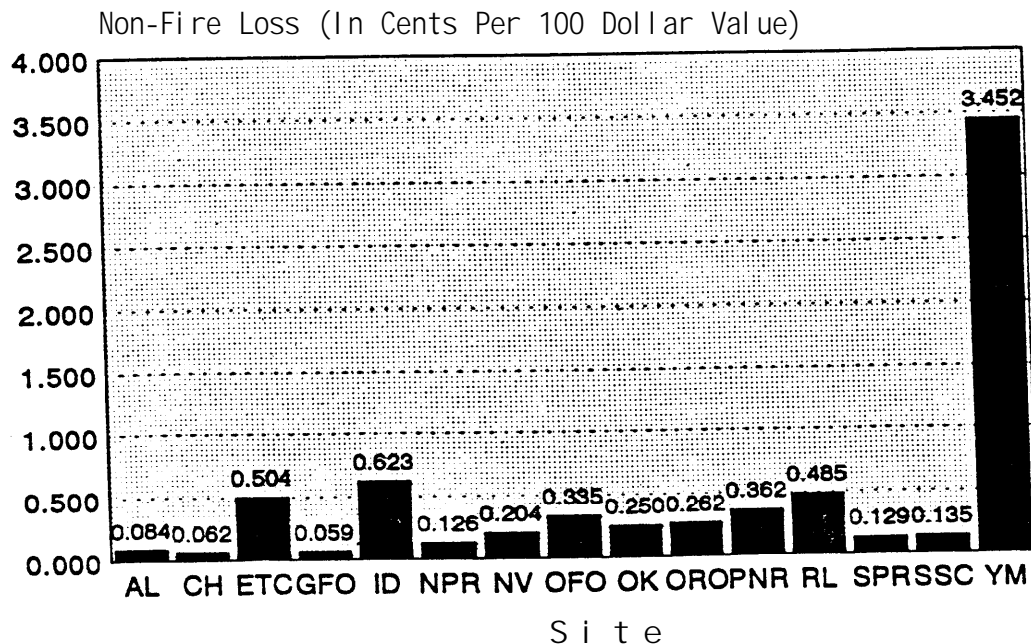


Figure 6

LOSS RATES-BY FIELD ORGANIZATIONS



Fire Protection Summary
For Calendar Year 1994

SIGNIFICANT FIRE LOSS DATA

The following is a brief review of the five largest DOE fire losses.

1. BPA - Slag from a welding operation caused internal fire to C-phase T-1355 Transformer. Loss estimated to be \$570,000. Ongoing (internal) investigation. No CAIRS or ORPS reports identified.
2. CH/BNL - Fire in the HFBR facility Tristan experimental enclosure breached the confinement system releasing radioactive material into the HFBR confinement building. Equipment loss was valued at \$84,000, cleanup costs estimated to be \$138,900. CAIRS does not have a report on this incident. ORPS No.: CH-BH-BNL-HFBR-1994-0005.
3. ID/INEL - Range fire ignited by sparks from a car rim involved the NW Boundary of the INEL. Loss estimated at \$200,000. No CAIRS or ORPS reports identified.
4. SPR - St. James crude oil river terminal. Fire in the main site substation switchgear building caused approx. \$197,000 damage. No CAIRS or ORPS reports identified.
5. RL - A fire occurred in an electrical load bank caused by a circuit overload. Loss estimated at \$101,050. No CAIRS or ORPS reports identified.

Other losses of interest are included in the following table:

LOSS TYPE	LOCATION	DESCRIPTION	DOLLAR LOSS
Fire	AL/sNL	2-1/2 ton flatbed dump truck was totally destroyed after passing through a pile of tumbleweeds. ORPS: NMFAC-1994-0010; CAIRS: 94-258-03	\$28,000. *
Fire	AL/PAN	Pad mounted, gear-powered automatic transfer switch (ATS) malfunctioned during testing which caused an electrical arc and fire in the ATS switchgear. CAIRS: 94-258-03	\$23,500. **
Fire	OAK/ETEC	Sodium leak in flow meter caused a small sodium fire. ORPS NO. : SAN-ETEC-SPTF-1994-0001	\$5,000. ** \$38,000. **
Fire	HQ/GTN	An electrical short in a buss line caused a fire in generators A & C. Sprinklers activated controlling the fire to the enclosure.	\$50,000. *
Fire	RL	Overheated tar spilled onto the ground causing the tar trailer to catch fire. A 25-gal propane tank exploded. CAIRS: 94014	\$14,538.
Fire	Yucca	Fire ignited in a combustible canvas tent when welders were working on a tunnel boring machine. CAIRS: 94-0622	\$8,329.
Fire	OR/K- 25	Cooking range caught fire at the fire station when an element was left on with a pan full of oil.	\$5,000. **

*CAIRS reported incident as a transportation event with a \$14,247 loss.

No CAIRS report: * Lost Revenue

WATER-BASED AUTOMATIC SUPPRESSION SYSTEM PERFORMANCE

A total of 220 incidents were reported where water-based suppression systems operated in CY 1994: 12 were wet-pipe systems, 193 dry-pipe, 7 deluge, 1 pre-action 4 foam deluge systems and 3 dock oscillating monitor (deluge) systems. Of the wet-pipe system activations, two were directly related to fire. Two dry-pipe system activations were also fire related. Nearly all other system activations (190 events) were caused by freezing conditions. Most of these activations relate to a single event at the OR/K-25 site where frozen pipes caused the failure of 182 improperly converted and poorly maintained wet-pipe sprinkler systems.

Water-based system activations of interest are shown in the following table. The designation NR indicates that this report was not included in the CAIRS Summary and mentioned (without a dollar loss report) in the field organization's annual fire protection report. It should be pointed out that the CAIRS database contains no records on many of these losses. Since the CAIRS database is the official record holder for these events, under-reporting only serves to reduce the significance of DOE's overall loss control program.

Loss TYPE	LOC.	DESCRIPTIONS	DOLLAR LOSS I
Nature	OR/K-25	182 sprinkler systems froze during severe cold weather conditions.	\$688,000.*
Nature	METC	Two 13,000 cfm toxic gas exhaust operated during cold weather, causing the sprinkler system to freeze. ORPS:HQ-GOME-METC-1994-0001.	\$19,000.*
Electrical	SPR	Failure of the control panel detector module caused the AFFF deluge system to activate at the Bryan Mound site. CAIRS report No. not given.	\$13,000.
Fire	OAK/LBL	An oil-filled capacitor fire in Bldg.58-A was extinguished by a single sprinkler.	\$10,000.*
Mechanical	ID/INEL	Excess pressure in the sprinkler system caused the F.D connection check valve to fail.	\$10,000.*
Fire	AL/ITRI	A 24-volt thermostat wire shorted to metal exterior wall causing a fire which was subsequently extinguished with a single sprinkler. CAIRS No: 94020-FIRE.	\$9,700.
Nature	ID/INEL	Warehouse dry-pipe system freeze-up.	\$9,000.*
Human Error	SPR	Failure to reset the Programmable Logic Controller caused the AFFF deluge system to activate at the Bryan Mound site. CAIRS report No. not given.	\$6,850.
Mechanical	NV/LVAO	Failure of an overhead roll-up door damaged the sprinkler system, causing the system to activate.	\$5,890.*
Fire	CH/FA	A soldering iron in Lab 3 was left on over the weekend and not stored in approved holder. Fire was extinguished by 1 dry-pipe sprinkler.	\$5,000.*
Nature	RL	Condensate in dry-pipe inspector's test valve froze.	NR
Mechanical	RF	Newly installed compressor activates loading dock sprinkler system	NR
Mechanical	AL/SNL	A Grinnell Co. Inc. Model F950 automatic sprinkler head started seeping in a computer room.	<\$1,000.*
Human Error	OR/ORNL	During routine maintenance, the deluge system inadvertently tripped into a hot cell enclosure.	NR

Fire Protection Summary
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LOSS TYPE	LOC.	DESCRIPTION	DOLLAR LOSS
Fire	OR/PGDP	A coffeepot failed causing a fire that was controlled by 4 sprinklers off a dry-pipe system.	NR
Mechanical	OK/LLNL	Air leak on a newly installed pneumatic detection system activates cooling tower deluge system.	NR
Mechanical	CH/ANL-W	Steam system failed to close causing the sprinkler system to operate ORPS No: CH-AA-ANLW-FCF-1994-0005	NR

* No CAIRS Report

There are now 224 incidents in DOE records where sprinkler systems operated in a fire. The satisfactory rate of performance is 99.1 percent, or 222 times out of 224 incidents. The two failures were a shut cold weather valve in 1958, controlling a single sprinkler in a wood dust collector, and a deluge system failure due to a hung-up trip weight in a 1963 transformer explosion.

To date, the DOE has experienced 96 fires that were either controlled or extinguished by wet-pipe automatic sprinkler systems. As shown in the table below, approximately 94 percent of the fires were controlled with less than 4 sprinklers activating.

DOE Wet-Pipe Automatic Sprinkler Performance
1955 to 1994

Sprinklers Operating	No. of Fires	Cumulative Total	Percent of Total	Cumulative Percent
1	68	68	71	71
2	16	84	17	88
3	4	88	4	92
4	2	90	2	94
5	2	92	2	96
6	1	93	1	97
7	2	95	2	99
8	0	95	0	99
9+	1	96	1	100

HALON SUPPRESSION SYSTEM PERFORMANCE

Concerns regarding the effect of chlorinated fluorocarbons (CFCS) and Halons on the ozone layer have led to regulations conforming with the 1991 Clean Air Act. The Environmental Protection Agency has subsequently drafted rules on this regulation to include: prohibiting new halon production; establishing container labeling requirements; imposing Federal procurement restrictions, imposing significant Halon taxes; issuing requirements for the approval of alternative agents; and listing essential areas where Halon protection is considered acceptable.

DOE's current policy does not allow the installation of any new Halon systems. In addition, Field Organizations have been requested to aggressively pursue alternative fire protection configurations for existing systems and to effectively manage expanding Halon inventories as a result of downsizing. Halon inventory will eventually be "banked" at a central location and utilized to replenish drawdown from existing systems determined essential to the mission of the Complex. The long-term goal being the gradual replacement of these essential systems.

The following report updates the extent of Halon use throughout the DOE. This information was solicited from Field Organizations in the AFPS data request.

In CY 1994, the DOE had 742 Halon 1301 systems in operation containing approximately 307,760 pounds of agent. Halon 1301 inventory was reported at approximately 111,376 pounds. Operational and inventory amounts for the Halon 1211 were reported at 194,160 and 24,633 pounds, respectively. A central repository has been established at the Savannah River Site.

Field Organizations reported that 72 non-essential systems have been disconnected, increasing DOE's Halon inventory by approximately 26,000 pounds. This represents an approximate 9 percent reduction in the previous year's operating volume.

The following table provides a breakdown of the five largest Halon utilizing field organizations. The bulk of Halon retained within the PA is shared between BPA (14,495 lbs. in 6 systems) and WAPA (13,319 lbs. in 29 systems). Drawdown amounts represent the amount of Halon that was released to the environment over the calendar year.

Fire Protection Summary
For Calendar Year 1994

LOCATION	HALON 1301		AGENT DRAWDOWN	HALON 1211	
	ACTIVE (LBS.)	INVENTORY (LBS.)		ACTIVE (LBS.)	INVENTORY (LBS.)
SR	75,089	16,000	2,102	2,600	650
AL	46,731	11,826	72	65,506	21,506
CH	40,902	23,608	270	25,395	85
PA	28,401	2,788	0	42,748	0
SPR	30,638	0	0	478	0
Total	223,062.00	55,523.00	2,444.00	137,938.00	23,452.00

A total of 21 incidents were reported where Halon 1301 suppression systems operated in CY 1994. No sites reported any Halon system failures during a fire. Approximately 3,159⁶ pounds of agent were discharged in these events.

The table on the following page lists all Halon 1301 system activations in CY 1994 of 100 pounds or more. The designation NR indicates that this report was not included in the CAIRS Summary and mentioned (without a dollar loss report) in the field organization's annual fire protection report.

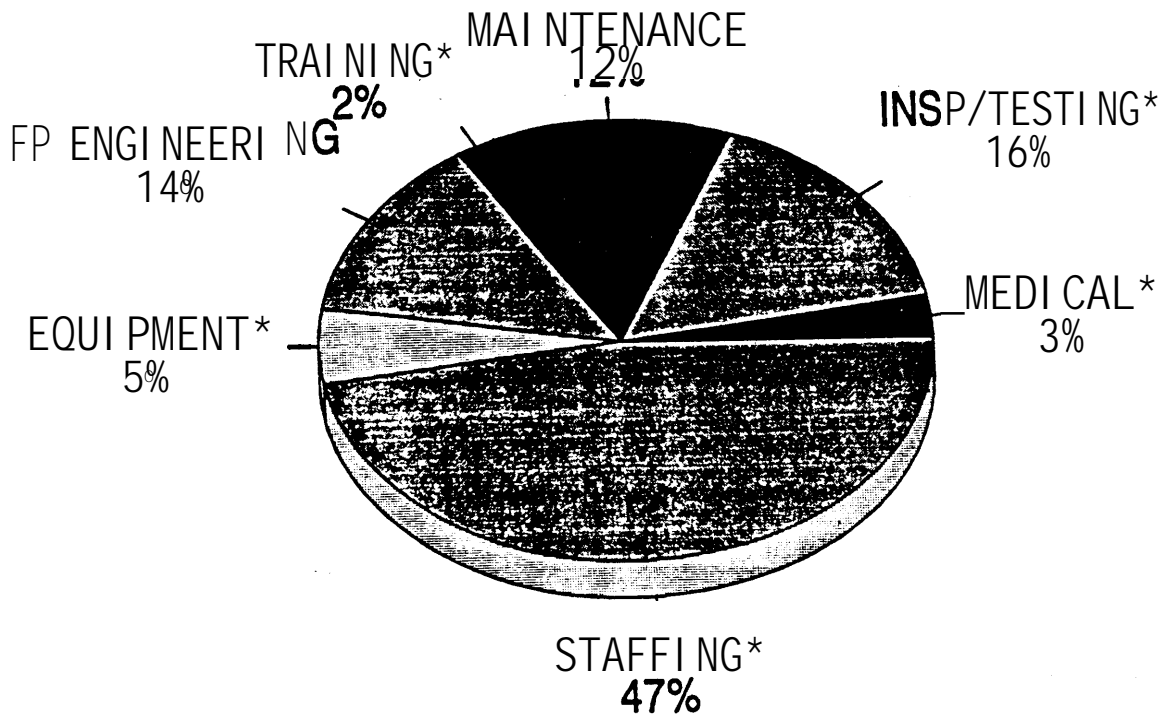
⁶ The above figure does not consider system leakage.

Fire Protection Summary
For Calendar Year 1994,

LOSS TYPE	LOCATION	DESCRIPTION	AGENT RELEASED	DOLLAR LOSS
Nonfire-Mechanical	SR/SRS	Excessive heat caused by malfunctioning HVAC system actuates Halon system.	600 lbs.	NA
Nonfire-Miscellaneous	SR/SRS	Spurious alarm causes halon system to actuate.	461 lbs.	NA
Nonfire-Mechanical	SR/SRS	Building process airflow vented into clean room allowing dust to actuate the halon system.	402 lbs.	NA
Nonfire-Human Error	RL	Halon system discharged into gloveboxes during construction upgrade. CAIRS No: 94-0015.	338 lbs.	\$17,900.
Nonfire-Miscellaneous	CH/BNL	Lifting fixture being moved pinches heat detector line causing system actuation. ORPS No: CH-BH-BNL-AGS-1994-0004	270 lbs.	\$1,350. *
Nonfire-Human Error	SR/SRS	Halon panel diagnostic causes system actuation.	161 lbs.	NA
Nonfire-Electrical	RF	Computer room discharge due to static build-up on an improperly grounded service panel.	150 lbs.	NR
Nonfire-Electrical	SR/SRS	Halon control panel malfunction caused system actuation.	140 lbs.	NA*
Nonfire-Mechanical	RL	Overflowing HVAC drip pan caused Halon Control Panel to short out.	127 lbs.	NA
Nonfire-Nature	NV/STL	Halon system in an anechoic chamber actuated during the CA earthquake.	100 lbs.	\$5,000. *

FIRE PROTECTION PROGRAM HIGHLIGHTS

1. Recurring fire protection costs for CY 1994 approached \$104 million for the DOE complex. On a ratio of cost to replacement value, the DOE spent approximately 8.3 cents per \$100 replacement value for recurring fire protection activities. Costs do not include any supplemental contracts with off-site fire departments or any fire protection construction projects. A breakdown is provided in the following chart, based on information received from responding field organizations.



COST DISTRIBUTION

* Fire Department Activities

2. The following is a summary of fire department responses for CY 1994. These numbers represent data sent in from approximately 28 fire departments stationed at DOE sites.

1. Fire	1,328
2. Other Emergency	2,314
3. Other Non-Emergency	2,973
4. Medical	2,040

APPENDIX F
ANNUAL SUMMARY OF FIRE DAMAGE EXPERIENCE REPORT FOR CALENDAR YEAR XXXX

1. FIRE-RELATED DEATHS AND INJURIES. Describe each incident relating to death or injury by fire.

2. DOE PROPERTY LOSS EXPERIENCE FOR THE CALENDAR YEAR.

Fire Loss \$ _____

Other Loss \$ _____

- a. Fire Loss includes damage or loss sustained as a consequence of and following the outbreak of fire. The test for whether or not a fire loss is reportable is based upon the fire department incident report. If the occurrence results in a dispatch and fire department response, then the loss is considered in the "Fire Loss" category. If a fire department incident report was not generated, or the report relates to a non-fire event, then the loss is considered a part of the "Other Loss" category. Exceptions are as follows:

- (1) Burnout of electric motors and other electrical equipment through overheating is considered a fire loss only if self-sustained combustion exists after power is shut off.
- (2) Vehicle losses (including aircraft, marine, and railroad equipment) are considered a fire incident if the loss was sustained as a direct consequence of fire. All losses, including fire, that involve cargo during transport are treated as transportation losses. Fire department incident reports will specifically identify these incidents.

- b. Other Loss includes damage or loss sustained as a consequence of the following events.

- (1) Explosions.
- (2) Natural cause events (such as earthquakes and hurricanes).
- (3) Electrical malfunctions.
- (4) Transportation (cargo) losses.
- (5) Mechanical malfunctions.
- (6) Radiation releases or other nuclear accidents.

- (7) Miscellaneous accidents (such as thermal -, chemical -, or corrosion-related accidents).

These other events may not be associated with a corresponding fire department incident report.

3. SUMMARY OF FIRE DAMAGE INCIDENTS.

- a. Describe each fire incident that results in a loss estimate over \$5,000. Description should be taken from the Fire Department Incident Report.
- b. Incidents for which the estimated loss is below this threshold (\$5,000) should be summarized and reported at the end of the calendar year in conjunction with the development of the annual summary.
- c. For each incident, identify the property loss as defined in paragraph 2. above, and provide the fire incident report number. (Refer to NFPA 902M, "Fire Reporting Field Incident Manual.")

4. INCIDENTS ACTUATING AUTOMATIC FIRE SUPPRESSION SYSTEMS.

- a. Describe each incident involving the actuation of an automatic fire suppression system. Include the loss amount, type of system, number of sprinkler heads activated, quantity of agent discharged, and remedial actions taken to prevent future accidental discharges, if applicable.
- b. Include a causative factor description in the summary according to fire or "other" category headings, with the latter sub-categorized as follows:
 - (1) Electrical
 - (2) Mechanical
 - (3) Human Error
 - (4) Acts of Nature
 - (5) Miscellaneous

5. HALON REDUCTION ACTIVITIES.

- a. Hal on 1301.

- (1) Number of fixed systems.

- (2) Total quantity (lbs.) of Halon 1301 at site.
 - (a) Active (include reserve) _____
 - (b) Inventoried _____
- (3) Number of fixed systems and system quantity deactivated within the past year. _____
- (4) Number of fixed systems and system quantity converted to manual operation within the past year. _____

b. Halon 1211.

- (1) Total quantity (lbs.) of Halon 1211 at site.
 - (a) Active _____
 - (b) Inventoried _____
- (2) Quantity replaced by other agents within the past year. _____

6. FIRE PROTECTION INSPECTION TESTING AND MAINTENANCE ACTIVITIES.

a. System Type.

- (1) Number inspected, tested, or maintained.
- (2) Number failing to meet operability requirements.

<u>Unmet Operability</u>	<u>Number</u>
<u>Requirement Description</u>	<u>Failed</u>

- b. All failures of fire protection systems (sprinkler systems, fire alarm systems, etc.) should be reported annually. "Failure" in this context is the inability to meet at least one of the "Operability Requirements" established for the system as part of the inspection, testing, and maintenance program. (Refer to DOE 420.1, "Facility Safety," of 9-30-95.) Summaries should be provided for each system type at the site. System types are described as follows:

Wet Pipe Sprinkler System
 Dry Pipe Sprinkler System
 Deluge Sprinkler System
 Pre-Action Sprinkler System (with supervisory air)
 Pre-Action Sprinkler System
 Foam-Water Extinguishing System
 Wet Standpipe System

Dry-Standpipe System
 Manual Water Spray System
 Halon 1301 (total flooding)
 Halon 1211 (total flooding)
 Dry Chemical System
 Wet Chemical System
 High Expansion Foam System
 Carbon Dioxide Extinguishing System (high pressure)
 Carbon Dioxide Extinguishing System (low pressure)
 Water Spray System (local application)
 Special Extinguishing System
 Pond or Lake Water Supply
 Tank Water Supply System
 Fire Pumps
 Fire Service Mains
 Fire Alarm Systems
 Central Monitoring (fire system)
 Fire Doors and Windows
 Fire Dampers
 Fire Wall Integrity
 Emergency and Exit Illumination

7. FIRE DEPARTMENT ACTIVITIES.

a. Number of Responses.

- | | |
|---------------------|-------|
| (1) Fire | _____ |
| (2) HAZMAT Response | _____ |
| (3) Other Emergency | _____ |
| (4) Non-Emergency | _____ |
| (5) Medical | _____ |

Identify and classify all fire department response ~~events~~. For this reason, each response should be recorded in a single fire department incident report from the first due or incident commander's perspective. Supplemental reports or responses should not be included in this report.

The "fire" response category relates to working fires on the site that were either extinguished or verified as a fire event by the responding incident commander. HAZMAT response relates nonfire hazardous material incidents. The "other emergency" category is intended for all other emergencies in which firefighting apparatus was dispatched, including offsite mutual aid response, or support for a medical response. The "non-emergency" category relates to situations where the initial response was considered an emergency, but was later verified as a non-emergency by the incident commander. This includes inadvertent system actuation, malicious

alarms, or offsite mutual aid that was canceled enroute. Medical response includes any response in which an ambulance was dispatched for the sole purpose of a medical emergency.

- b. Major Equipment Purchases. Describe type of equipment and purchase price.

(1) Emergency Vehicles _____

(2) Other _____

- c. Notable response descriptions not already included in this report.

8. RECURRING FIRE PROTECTION PROGRAM COSTS. Include figures on the present and past 2 years:

- a. Fire Department costs:

(1) Staffing _____

(2) Equipment _____

(3) Inspection & Testing Program Costs _____

(4) Emergency Medical Response Program costs _____

(5) Training Program Costs _____

- b. Inspection and testing program costs by others. _____

- c. Fire protection engineering. _____

- d. The cost of paragraph b. above is intended to identify work provided by other departments, such as a maintenance section or outside contractor. Do not include costs of mobile apparatus or other major equipment purchases. Provide additional explanation for significant deviations in recurring costs between calendar years.